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The Economy and Environment Program for Southeast Asia (EEPSEA) was established in May 1993 to support training and research in environmental and resource economics across its 10 member countries: Cambodia, China, Indonesia, Laos, Malaysia, Papua New Guinea, the Philippines, Sri Lanka, Thailand, and Viet Nam. Its goal is to strengthen local capacity for the economic analysis of environmental problems so that researchers can provide sound advice to policymakers.

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The Burning Question : Better Options For Incineration In Manila

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Some of the most enduring images of Southeast Asia's environmental crisis are photographs of waste pickers climbing over towering mounds of smoking rubbish. Waste management is a massive problem across the region, particularly in the region's mega-cities. A new study from Metro Manila in the Philippines has looked at one controversial way of dealing with this challenge: incineration. →

A summary of EEPSEA Research Report 2004-RR7, *Clean Incineration of Solid Waste: A Cost-Benefit Analysis for Manila* by Loreta and Carlito Rufo, Jr., Resources, Environment and Economics Center for Studies (REECs), Suite 405, The Tower at Emerald Square, J.P. Rizal cor. P. Tuazon Sts. Project 4, Quezon City 1109, Philippines.
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Modular-starved air incinerators

→ The report finds that incineration technology is available that meets the Philippine's national pollution guidelines on dioxin emissions—namely modular starved-air incineration. It recommends that the current national ban on incineration should therefore be re-examined.

A Waste Crisis

The study was carried out by Loreta and Carlito Rufo, Jr. from the Environment and Economics Center for Studies (REECs), Quezon City. It was undertaken to help resolve the on-going waste management crisis in Metro Manila. Everyday, the city generates many thousands of tonnes of solid waste. Only a small percentage of this is recycled, some is illegally dumped and the remainder is sent to sanitary landfills and open dumps. Unfortunately, this is not an adequate solution: In 1998 and 2000 two of the cities major landfills reached their capacity, while another key site, the Payatas dump, had to stop accepting waste when a 'waste slide' killed several people. The subsequent lack of disposal sites led to a garbage emergency in the Metro area. In response, two mothballed sanitary landfill sites were revived and the Payatas dumpsite was re-opened. However, at the time of the study, more than half of

the Metro area's solid waste remains uncollected.

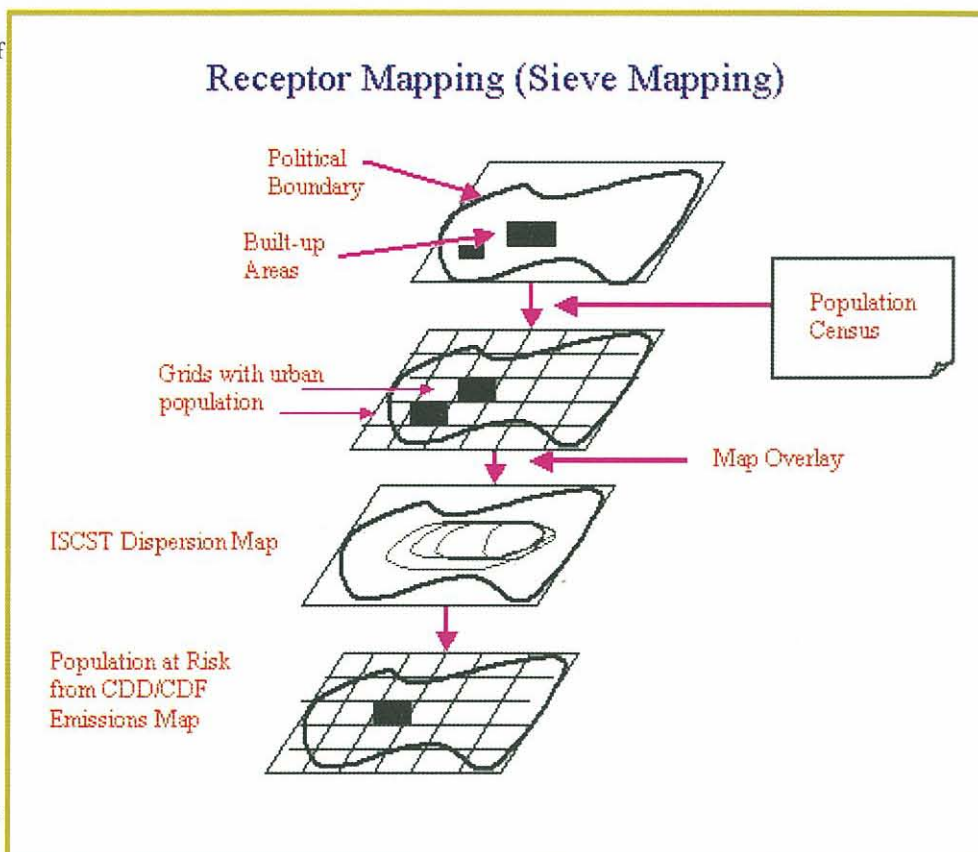
The Burning Issue

Despite this on-going problem, incineration was banned under the Clean Air Act (CAA) of 1999, mainly due to concerns about dioxin pollution and related health threats such as cancer. This ban has created acrimony between local government officials, who view incineration as an effective solution to the city's solid waste problems, and environmental groups, who cite the cost and health impacts of the technology. These green groups also voice concerns that

incineration will divert efforts away from waste recycling, reuse, and recovery.

According to the researchers, the principal reason for this controversy is a lack of objective information on the impact of incineration. They therefore set out to estimate the health impacts of this technology to see whether they would be politically and socially acceptable.

Since there are no municipal solid waste incinerators in the Philippines, the only way to investigate the impact of such a plant was to model the performance of a hypothetical incineration facility. Discussions



Procedure for Risk Mapping

are less costly and less polluting

Unit Cost of Incineration Plant (Million Pesos, 200 prices)

Item	Cost	Modular Starved-Air	Rotary Kiln
Combustors	Capital Cost	11.88	89.17
	O & M Cost	0.83	89.17
Fabric Filter	Capital Cost	1.50	18.72
	O & M Cost	1.36	16.96
Dry Sorbent Injection	Capital Cost	25.12	25.12
	O & M Cost	17.58	17.58

with the Environmental Management Bureau revealed that the most suitable site for an incinerator was near the LIMA Technology Center, an industrial estate 65 kilometers south of Manila. This site was chosen as the location for the hypothetical plant.

Comparing Technologies

Two different incineration technologies were investigated so that issues such as construction costs and pollution performance could be compared. The first was mass-burn rotary kiln incineration (termed 'Without' Project), which was being considered by the Philippine government at the time of the study. The second was modular starved-air incinerator technology (termed 'With' Project). Emissions tests conducted by the National Center for Environmental Assessment-US Environmental Protection Agency (USEPA-NCEA) indicate that the rotary kiln technology will not meet

national dioxin emission standards while modular starved-air incinerators will.

The study focused on the potential dioxin emissions of each technology option. (The researchers acknowledged that these are not the only pollutants from incinerators that can harm human health, though they are the most serious.) Third-party technical data was used to work out dioxin emissions. Air dispersion modelling was used to project how these emissions would spread. This pollution dispersal information was compared with a population distribution map to estimate how many people would be at risk.

Dioxin can be inhaled or ingested. However only data on the amount of dioxin people could inhale was available. This was extrapolated to determine the total exposure to the pollutant that people would experience. It was assumed that 10% of total dioxin exposure could be

attributed to inhalation exposure.

This was based on US-EPA dioxin research. A sensitivity analysis was also conducted which put inhalation exposure at 2%, based on a study in Hong Kong.

Costing Health Impacts

Although dioxins can be responsible for a multitude of adverse health effects, the researchers only looked at the risk of acquiring cancer due to dioxin exposure. The number of people potentially at risk of developing cancer was estimated by multiplying dioxin exposure with a 'slope factor' that was obtained from sources such as USEPA research. The cost of the resulting increase in cancer was then valued. This was done using the Value of Statistical Life (VSL) approach. This used information from India about people's willingness to pay to reduce their risk of death from air pollution and adjusted it to take into account the economic situation in the Philippines.

The researchers found that the present value of adverse health effects caused by the rotary-kiln incineration technology was PHP 12.8 billion. The equivalent figure for the modular starved-air incinerators was PHP 4.9 billion.

Running Costs and Costs to Society

To get a complete picture of the costs and benefits of the different incineration technologies, data on capital and annual costs were obtained from sources such as the EPA-CICA and USEPA-NCEA. The capital, operating and maintenance costs of the modular starved air technology were found to be far below those of the rotary kiln.

For example, the unit cost of running the combustors in the

modular starved-air plant was PHP 11.88 million compared to PHP 89.17 million for the rotary kiln. This was explained by the fact that, to burn the same amount of solid waste, the modular starved-air incinerator can be smaller and therefore less costly than a rotary kiln incinerator. Given the direct cost and social cost figures for both incineration technologies, the overall cost per ton of waste incinerated for each was calculated. This amounted to USD 30/ton for modular starved-air and USD 79/ton for the rotary kiln.

Giving Incineration a Second Thought

The study concludes that an incineration technology that operates within accepted pollution standards is not only available but would actually

be less costly than incineration methods that produce more pollution.

A comparison of the economic and environmental costs of incineration versus those of other waste disposal options, such as landfill, was beyond the scope of the study. But preliminary estimates of landfill costs from other studies suggest that they can be quite high. More extensive research on the costs and environmental impacts of landfill would be invaluable for purposes of comparison. Given the difficulties the country faces in achieving its targets with current methods, careful consideration of all the options - based on evidence rather than perception - is badly needed.

PHP 56 = 1 USD (June 2004)

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